# MANUAL

## CONTROL UNIT FOR ROTATING HEAT EXCHANGER

# VariMax100

Art. no. F21100201

IBC control

Made in Sweden

## PAGE REFERENCE


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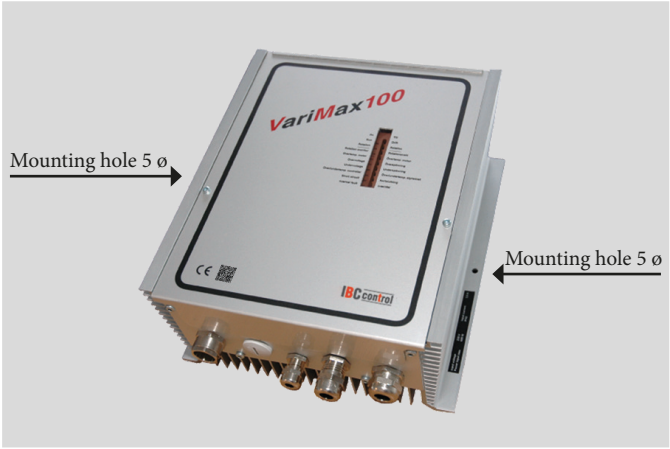
## INSTALLATION INSTRUCTIONS

| | |
|---|---|
| Warning indication | The control unit must only be used in perfect technical condition. Any damage that may affect safety must be dealt with immediately. |
| Maintenance/Repairs | The function of the control unit should be checked regularly. Troubleshooting and repairs must only be performed by trained personnel.<br>Prescribed electrical protection must be implemented. |
| Disposal and recycling | When replacing components or when the control unit in its entirety need replacing, please follow the advice below:<br>The aim should always be maximum possible recycling of raw materials, with minimum possible environmental impact.<br>Never dispose of electrical components with ordinary waste, always use the designated collection points.<br>Disposal should be as environment-friendly as the technology allows in terms of environmental protection and recycling. |

## MOUNTING



## SAFETY INSTRUCTIONS

The following symbols and references will be used in this description.
These important instructions apply to personal protection and technical safety during operation.

| | |
|---|---|
| | "Safety instruction" represents instructions that are intended to avoid the risk of personal injury and to prevent damage to equipment. |
| | Danger! Electrical current to electrical components!<br>Note! Switch off the main current before removing the cover.<br><br>Never touch electrical components or contacts while main current is switched on. Risk of electric shock, resulting in serious injury or death.<br><br>Connected terminals contain residual voltage even after the main current has been switched off. |

## MANUFACTURER'S DECLARATION

| | |
|---|---|
| **Manufacturer** | IBC control AB<br>Brännerigatan 5 A, SE-263 37 Höganäs, Sweden |
| **Product** | Control unit for rotating heat exchanger |
| **Type designation** | VariMax100 |
| **Article number** | F21100201 |

**EU directive applied to the product**

The manufacturer's declaration of conformity with the requirements of the EMC Directive 2004/108/EC.

All control units are approved according to the requirements of the EMC Directive 2004/108/EC and are tested according to standard EN 61800-3:2004, emission category C1 and immunity category C2.

All control units comply with the Low Voltage Directive 2006/95/EC, standard EN 61800-5-1.

All control units are designed for installation in environments subject to pollution degree 2.

This product also complies with the RoHS Directive 2011/65/EU.

Höganäs 2015-07-01
IBC control AB

Christer Persson
MD

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We use FreeRTOS v6.1.0 (http://www.freertos.org) in this product and this source code can be supplied by us.

## DESCRIPTION OF FUNCTIONS

- The VariMax100 is part of a range of control units adapted for optimum control of rotating heat exchangers, with the necessary additional functions.
  The range consists of three sizes: VariMax25, VariMax50 and VariMax100. All control units run a 3-phase stepper motor. All control units have an input signal of 0-10 V.
- VariMax100 is designed for wheels up to 3900 mm with a wheel speed of max. 12 rpm. If the wheel requires a faster wheel speed, the rotor diameter should be reduced.
- VariMax100 has built-in shift of the input signal, which means that the wheel's efficiency is proportional to the input signal.
- VariMax100 has a preset threshold value of 0,1 V (hysteresis 0,13–0,07 V). If the input signal falls below this value, the wheel stops.
- VariMax100 has a rotation monitor (magnet mounted on the wheel with associated magnetic sensor) and built-in cleaning function. The functions can be disconnected via DIP switches.
- VariMax100 starts automatically after voltage drop-out, and resets all alarms on restart.

- The VariMax-motor100 is a stepper motor with substantial moment over the entire speed range.
- When the motor is stationary, holding moment is activated, which means that the wheel always remains still. The holding moment disappears if the voltage to the control unit is lost.
- The motor is mounted with a 3 m cable as standard.
- If total cable length exceeds 3 m, external EMC filters should be used.

## TECHNICAL DATA CONTROL UNIT

| | |
|---|---|
| Connection voltage | 1x230-240 V +/-15% 50/60 Hz |
| Power input, max. | 500 W |
| Input current, max. | 2,2 A |
| External fuse, max. | 10 A |
| Output voltage*) | 3x0-280 V |
| Motor current/phase | 3,2 A |
| Internal fuse **) | 4 AT |

| | |
|---|---|
| Output frequency | 0-333 Hz |
| Acceleration and retardation time | 30 sec |
| Ambient temperature, non condensing | -30 - +45 $^{O}$C |
| Protection form | Type 1/IP54 |
| Weight | 2,6 kg |
| Dimensions, HxWxD | 233x205x104 mm |

*) Exact value cannot be obtained with a digital measuring instrument

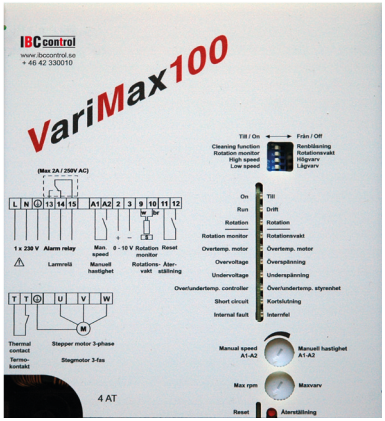
**) The fuse protects both motor and electronics

## TECHNICAL DATA MOTOR

| | |
|---|---|
| Max. moment | 10 Nm |
| Min. rotation speed | 1 rpm |
| Max. rotation speed | 400 rpm |
| Motor temperature, mantle max. | 110 $^{O}$C |
| Shaft diameter | 19 mm |

| | |
|---|---|
| Shaft length | 35 mm |
| Ambient temperature | -30 - +45 $^{O}$C |
| Protection form | IP54 |
| Weight incl. motor bracket | 8,4 kg |
| Dimensions incl. shaft and motor bracket HxWxL | 142x150x180 mm |

## FUNCTIONS




← DIP switches ON to left

← Operational indications

← Alarm indications

← Adjustments

← Push button for Reset

## DIP SWITCHES

| | |
|---|---|
| **Cleaning** | Cleaning function connected in ON position.<br>When the wheel has been still for 30 minutes, the cleaning function is activated and the wheel rotates for 20 seconds at 12 rpm. |
| **Rotation monitor** | Rotation monitor connected in ON position. |
| **High speed *)** | The wheel rotates at the set max. rpm when the switch is set to ON. |
| **Low speed *)** | The wheel rotates at the preset min. speed (1 rpm) when the switch is set to ON. |

*) Manual running (test mode)

## OPERATIONAL INDICATIONS

| | |
|---|---|
| **On/Alarm** | "Voltage on" comes on with a fixed light.<br>Flashes when the control unit has tripped. |
| **Run** | Comes on when the motor is to rotate, i.e. when the input signal exceeds the threshold value. |
| **Rotation** | Flashes when the magnet passes the magnetic sensor, whatever the setting of the "Rotation monitor" DIP switch.<br>Flashes even if the input signal is lower than the threshold value. |

## ALARMS

In the event of an alarm the control unit restarts after 30 seconds. The respective red light diode comes on for the same duration (30 seconds).
After restart the light diode goes out, this happens twice. The third time, the alarm relay closes and the alarm "moves on". In order for the alarm relay to close and the alarm to "move on", the above three alarm signals must occur within 90 minutes, otherwise the sequence is reset.
The green light diode comes on with a fixed light for the first and second alarm and begins to flash on the third alarm. All alarms subsequently remain.

| | |
|---|---|
| **Rotation monitor** | Alarms and trips if a pulse is not received every 30 minutes at min. rotation speed (1 rpm) and every 20 seconds at max. rotation speed (400 rpm).<br>The time between these speeds is linear.<br>The function can be disconnected via DIP switches. |

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| | |
|---|---|
| Probable fault cause on installation | - Magnet turned the wrong way<br>- Magnet transmitter incorrectly connected (wrong polarity), see CONNECTIONS on page 9<br>- Too big a gap between magnet transmitter and magnet, max. 15 mm |
| Probable fault cause in operation | - Broken belt<br>- Belt slipping<br>- Stuck wheel<br>- The magnet transmitter or magnet is not intact |
| **Motor temperature** | Alarms and trips if the coil temperature in the motor is too high. The thermal contact in the motor returns to normal mode once the temperature falls. |
| **Over-voltage** | Alarms and trips if the input voltage exceeds 265 V. |
| **Under-voltage** | Alarms and trips if the input voltage falls below 190 V. |
| **Over/under temperature** | Alarms and trips if the temperature in the control unit goes above/below safe temperature level (+85 - -30 $^{O}$C). |
| **Short circuit** | Alarms and trips in the event of short circuit phase-phase or phase-earth. |
| Probable fault cause | - Short circuit between phases in cable or motor<br>- Short circuit between phase-earth in cable or motor<br>- Interruption to one phase in cable or motor<br>Measure motor resistance; it should be identical on all coils. |
| **Internal fault** | Alarms and trips if an internal fault in the control system has occurred. |

## ADJUSTMENTS VIA POTENTIOMETER

| | |
|---|---|
| **Manual speed** | By closing A1-A2 the speed is controlled via the potentiometer marked "Manual speed". Can be regulated between 1-400 rpm. The wheel rotates at the set speed, whatever the value of the input signal. Factory setting: 1 rpm on motor shaft. |
| **Max. speed** | Potentiometer for adjusting max. speed. Regulates between 50-400 rpm. Factory setting: 50 rpm on motor shaft. |

## PUSH BUTTON

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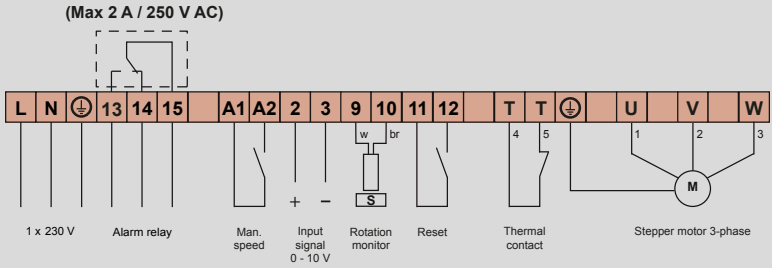
|---|---|
| **Reset** | Reset button for resetting the control unit. The control unit is also reset in the event of voltage drop-out and closure between terminal 11 and 12. |

## CONNECTION DIAGRAM




## CONNECTIONS

The voltage must be switched off before undertaking any work on the equipment.
Recommended tightening moment 0,5 Nm, max. tightening moment 0,8 Nm.

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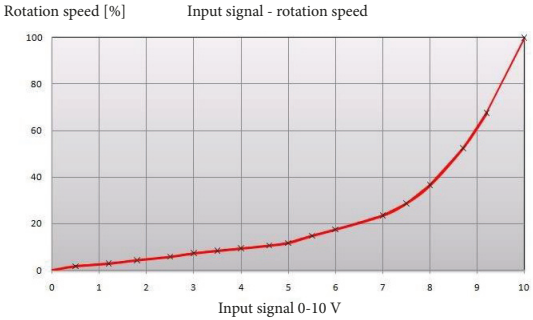
|---|---|
| **Connection voltage (L-N-PE)** | 1x230-240 V +/-15 %, 50/60 Hz.<br>NOTE! Protective earth must always be connected. |
| **Alarm relay (13-14-15)** | Closes between 14-15 in the event of an alarm or voltage drop-out.<br>Max. 2 A resistive load/250 V AC. |
| **Manual speed (A1-A2)** | Produces set rotation speed on closure. |
| **Input signal (2-3)** | 0-10 V.<br>Plus connected to terminal 2, minus to terminal 3. |
| **Rotation monitor (9-10)** | White cable connected to terminal 9, brown to terminal 10.<br>The magnet is installed with south side (S) towards the transmitter.<br>Max. distance 15 mm. |
| **12 V output (3-11)** | Output for 12 V DC. Terminal 3 is minus, terminal 11 is plus.<br>Max. 50 mA. |
| **Reset (11-12)** | Remote reset in the event of alarm.<br>The control unit is reset automatically in the event of voltage drop-out. |
| **Thermal contact (T-T)** | This must be connected to protect the motor against overheating. |
| **Motor (U-V-W)** | VariMax-motor100 must be used.<br>Direction of rotation is changed by switching two of the phases. |

## INPUT SIGNALS/ROTATION SPEED




The input signal is directly proportional to the efficiency of the wheel, which means that input signal and rotation speed are as per adjoining diagram.

## CHECKS BEFORE SWITCHING ON THE CONTROL UNIT

| | |
|---|---|
| **Check that** | the control unit is connected as per instructions on page 9.<br>Connection voltage 230-240 V +/-15%, 50/60 Hz. |
| **Check that** | the input signal is 0-10 V. |
| **Check that** | rotation monitor and cleaning function are connected. |

## PUTTING THE EQUIPMENT INTO OPERATION

Should be done in sequence

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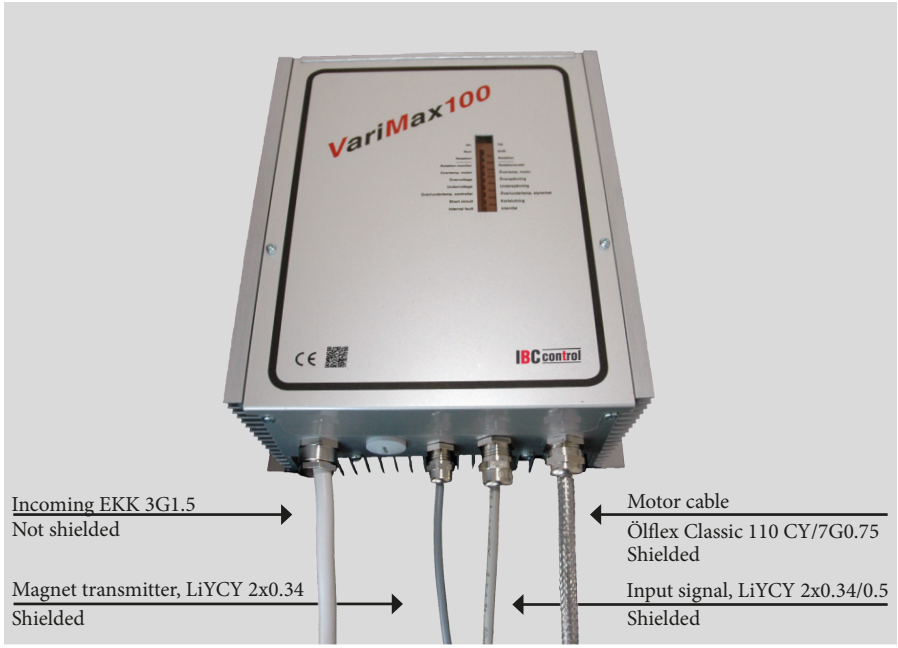
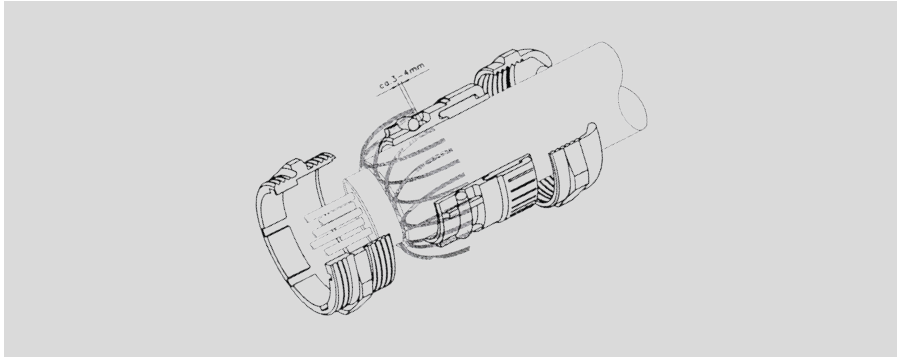
|---|---|
| **Check that** | the motor rotates in the right direction in relation to the wheel's direction of rotation.<br>In the event of a fault, switch two phases to the motor. |
| **Adjustment of max. speed** | Set the DIP switch to "High speed" in the ON position.<br>Adjust "Max. speed" so that the wheel rotates at 10-12 rpm (or as per directions from wheel manufacturer). |
| **Checking minimum speed** | Set the DIP switch to "Low speed" in the ON position.<br>Check that the wheel starts.<br>The minimum speed is preset. |
| **Checking the cleaning function** | Switch off the voltage.<br>Make sure that the "Cleaning" DIP switch is set to ON, and that the input signal is disconnected.<br>After switching on the voltage the wheel rotates for 20 seconds at 12 rpm. |
| **Checking the rotation monitor** | The yellow "Rotation" light diode should flash when the magnet passes the magnetic sensor, whatever the DIP switch position. |
| **Finish by** | having the control unit drive the wheel at maximum and minimum rotation speed and checking that the wheel speed is correct. |

## EMC INSTALLATION




EMC glands must be used for shielded cables.
The above cables, or equivalent, must be used to comply with the terms of the EMC Directive.

## EMC GLAND




NOTE!
When connecting the shielding to the EMC gland, it is important to connect as shown above.

## PERSONAL NOTES

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IBC control AB
Brännerigatan 5 A
SE-263 37 Höganäs
Sweden
Tel. +46 (0)42-33 00 10
Fax +46 (0)42-33 03 75
www.ibccontrol.se
info@ibccontrol.se